Forest Insect & Disease Management

Survey Report

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DUTCH ELM DISEASE
BAD RIVER INDIAN RESERVATION, WISCONSIN
USING REMOTE SENSING

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INTRODUCTION

The Bad River Indian Reservation, located in north-central Wisconsin, encompasses approximately 55,300 acres of forest land. Elm is a major component of the timber resource along the tributaries within the reservation. Since there is a substantial volume of elm on the area and the status of Dutch elm disease was unknown, the BIA requested that the St. Paul Field office provide assistance in evaluating the Dutch elm disease situation on the reservation.

OBJECTIVE

To determine the current and future volume impact of Dutch elm disease on the Bad River Indian Reservation.

METHODS

During July, 1975, 13 miles of the White River, 14 miles of the Bad River, 5 miles of the Potato River and 2 miles of the Marengo River on the Bad River Indian Reservation were flown at 1:12000 scale using an RC-10 camera mounted in an Aerocommander. The imagery was a 9-inch color infrared transparency format type. The remote sensed areas were plotted on a one-inch to the mile topographic sheet for ground reference data. Each image was interpreted for bottomland hardwood type and areas of dead elm trees. The number of dead and dying elm trees was recorded for each disease center on the image. Twenty-five disease centers were selected for ground truth correlation.

The DBH, # logs, tree condition, cause of condition and species were recorded for each tree in each infection center ground checked.

All photo interpretation data were adjusted using linear regression data obtained from the ground truth correlation.

The average volume for dead elm and dying elm and standard error of the mean were calculated using the volumes obtained from the ground truth collection. The average volumes were then applied to the total number of dead and dying elms on the remote sensed area.

RESULTS AND DISCUSSION

The remote sensing on parts of the four rivers within the reservation revealed that Dutch elm disease is spread throughout the area. Tree mortality on the Bad River and Marengo River is high throughout the 17 miles surveyed.

The impact on the Potato and White Rivers is light except for a 2-mile area where Highway 13 crosses the White River. Photo interpretation and ground survey revealed a substantial volume of live elm throughout the river bottoms with very light mortality in the upland stands.

Approximately 16,000 acres of the 48,500 acres remote sensed were classified as bottomland hardwoods. Of the 16,000 acres, 590 acres were classified as heavy elm mortality and 770 as moderate to light elm mortality. Of the 2,990 elm trees found dead or dying on the 1,360 acres, 25 percent were dying, 73 percent were dead, and 2 percent were dead or dying from causes other than Dutch elm disease.

Volume analysis of the data revealed 235,772 bd ft of dead standing elm plus 99,490 bd ft of elm that died in 1975.

The annual rate of mortality should increase each year until the elm resource is reduced to a low level, at which time the annual rate will decline. An 80% elm mortality is expected by 1990 for the Bad River Indian Reservation.

The acres surveyed, past mortality, current mortality, acres of mortality and volume estimates are summarized for each river basin in Tables 1 and 2. A map of the mortality areas and total flight lines is provided in Figure 1.

MANAGEMENT CONSIDERATIONS

The following action is recommended as a design to reduce the rate of Dutch elm disease spread and mortality.

1. Establish and keep current a map of all Dutch elm disease on the reservation.

2. Develop elm harvest zones. (When possible, harvest during September to December to help reduce beetle populations and the rate of spread.)

   a. Establish Red zones within 1 to 2 miles* of known infection centers (20 trees or more). Initiate accelerated harvest of elm resource within this zone.

   b. Establish Yellow zones within 2 to 6 miles* of known infection centers. Initiate an accelerated harvest of valuable elm stands and conduct an inventory of the remaining elm resource.

c. Establish Blue zones within 6 to 15 miles* of known infection centers. Conduct normal sales operation. Maintain an intensive inventory of the elm resource for future harvest information.

3. Confine shipment of elm logs with bark intact to September - December when possible.

4. Eliminate stockpile of elm logs at mills or in the forest during May - July when possible. Debarked or chipped elm wood is safe at any time.

Other considerations such as manpower, equipment, economics, markets, etc., should be looked at for planning a program that best meets the needs of the Bad River Indian Reservation.

* Distance should be adjusted to coincide with management objectives.

Table 1. Acreage figures by river remote sensed.

River	Acres Remote Sensed	Acres Heavy Mortality	Acres Moderate to Light Mortality
Potato	5,940	10	130
Marengo	1,800	75	40
White	21,360	40	70
Bad	19,400	465	530
Total	48,500	590	770

*Approximately 35% of remote sensed area of elm type.

Table 2. Number and volume of dead and dying elm by rivers.

River *	#Dead Elm Trees	#Dying Elm Trees	Mortality Other than DED	Volume (Bd Ft) Dead Elm	Dying Elm
Potato	160	55	5	17,762± 1,295	7,645± 810
Marengo	470	160	10	50,020± 3,720	22,240±2,380
White	210	70	5	22,470± 1,638	9,350±1,040
Bad	1360	450	35	145,520±10,600	60,255±6,700
Total	2200	735	55	235,772±17,253	99,490±10,930

*All data adjusted using linear regression (Correlation .89)

DUTCH ELM DISEASE SURVEY

BAD RIVER INDIAN RESERVATION, WISCONSIN

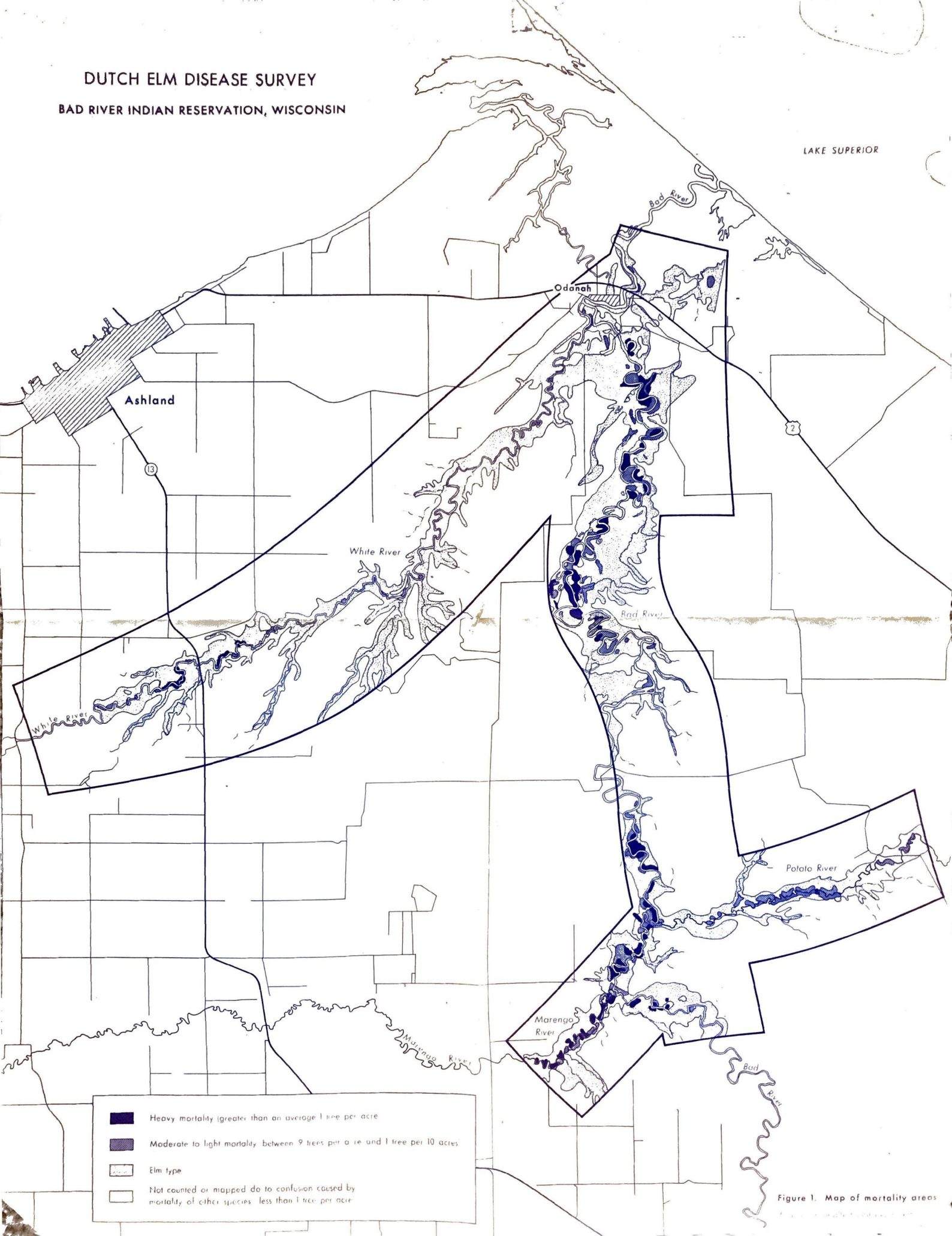
LAKE SUPERIOR
Bad River
Odanah
Ashland
13
2
White River
White River
Bad River
Potato River
Marengo River
Marengo River
Bad River
Heavy mortality (greater than an average 1 tree per acre
Moderate to light mortality between 9 trees per acre and 1 tree per 10 acres
Elm type
Not counted or mapped do to confusion caused by mortality of other species less than 1 tree per acre

Figure 1. Map of mortality areas